

27210 - Chemistry Laboratory

Información del Plan Docente

Academic Year	2016/17
Academic center	100 - Facultad de Ciencias
Degree	452 - Degree in Chemistry
ECTS	12.0
Course	2
Period	Annual
Subject Type	Compulsory
Module	---

1. Basic info

1.1. Recommendations to take this course

1.2. Activities and key dates for the course

2. Initiation

2.1. Learning outcomes that define the subject

2.2. Introduction

3. Context and competences

3.1. Goals

3.2. Context and meaning of the subject in the degree

3.3. Competences

3.4. Importance of learning outcomes

4. Evaluation

5. Activities and resources

5.1. General methodological presentation

5.2. Learning activities

5.3. Program

Seminars

1.- Basic concepts and database in Chemistry Laboratories. Security issues. Chemical products. Safety data sheets

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(SDS).

- 2.- Physicochemical methods and treatment of experimental data.
- 3.- Basic IR y RMN spectroscopy for structural characterization of simple organic compounds
- 4.- Use of video tutorials for step-by-step instructions on basic instrumental techniques in organic chemistry
- 5.- Chemical and electroanalytical methods. Practical considerations.

Laboratory sessions

Section 1. Experimental physicochemical techniques

- 1) Determination of thermodynamic properties (3 sessions of 3 h each).
 - Determination of the heat of combustion of a solid in a calorimetric bomb.
 - Measurement of the vapour pressure of a liquid using the isoteniscope method.
 - Determination of one equilibrium constant.
- 2) Determination of electrochemical properties (2 sessions of 2.5 h each).
 - Determination of the transport number of an ion by the movable boundary method.
 - Measurement of the electromotive force of some simple and concentration batteries.
- 3) Kinetic of chemical reaction (3 sessions of 4 h each).
 - Kinetic study of different chemical reactions in aqueous solution will be performed using spectrophotometric, polarimetric and conductimetric methods.

Section 2 . Synthesis, purification y characterization of inorganic compounds

- 1) Preparation of some compounds of boron from borax (1 session of 3.5 h).
- 2) Elements of group 15: test tube experiments (1 session of 3.5 h).
- 3) Production of gases. Preparation of copper salts from copper sulfate (2 sessions of 3.5 h each).
- 4) Preparation of some lead salts from minium (2 sessions of 3.5 h each).
- 5) Production of Cl_2 . Preparation of $\text{K}[\text{ICl}_4] \cdot x\text{H}_2\text{O}$ (1 session of 3.5 h).
- 6) Preparation and purification of manganese(II) chloride (1 session of 3.5 h).

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Section 3. Synthesis, purification y characterization of organic compounds

a) Purification techniques: column chromatography. Purification of the major product of a reaction mixture (1 session of 4 h).

b) Synthesis of compounds by typical organic reactions. Isolation, purification and characterization techniques in organic synthesis (5 sessions of 4 h each).

- Synthesis of tert-butyl chloride (unimolecular nucleophilic substitution, S N 1)
- Oxidation of diphenylethanol to benzophenone by chromic acid.
- Nitration of bromobenzene (electrophilic aromatic substitution, S E Ar)
- Elimination reactions: dehydration of alcohols (E1).
- Synthesis of phenacetin (bimolecular nucleophilic substitution, S N 2).

Emphasis will be placed on the appropriate safety handling of organic compounds and proper disposal of chemical waste. In addition, students will practice database searching of the physical properties of organic compounds and basic spectroscopic analysis, using that they have learned in previous seminars.

Section 4: Chemical and electroanalytical methods

1) Redox, EDTA, acid-base and precipitation titrations.

- Determination of sodium oxalate by redox titration with potassium permanganate (1 session of 4 h).
- Determination of chloride in sparkling waters by precipitation titration (Mohr's method) (1 session of 3 h).
- Determination of magnesium in a salt by EDTA titration (1 session of 4 h)
- Determination of hydrogen carbonate in still water by acid-base titration: use of chemical acid-base indicators and a pH electrode to find the end point (2 sessions of 3,5 h)

2) Potentiometry with Ion Selective Electrodes (ISE) and Anodic Stripping Voltametry (ASV) (2 sessions of 3,5 h each)

The study of those conditions affecting the quality of the measurements, the proper expression of the results together with their quality evaluation will be also carried out.

5.4.Planning and scheduling

5.5.Bibliography and recommended resources